

CRYSTA-Apex S Series

Bulletin No. 2097



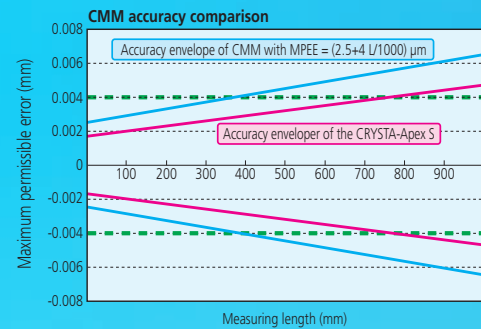
High-performance, low-price CNC coordinate measuring machine that meets global standards

Mitutoyo

CNC Coordinate Measuring Machine CR

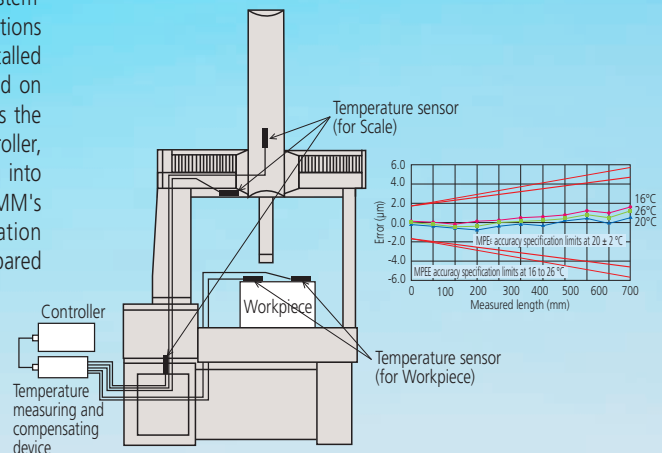
High accuracy in the 1.7 μm class

The CRYSTA-Apex S is a high-accuracy CNC coordinate measuring machine that guarantees a maximum permissible error of $*E_{0,MPE} = (1.7+3L/1000)\mu\text{m}$ [500/700/900 Series]. Let's compare the CRYSTA-Apex S with CMMs offering $*E_{0,MPE}$ of approximately $(2.5+4L/1000)\mu\text{m}$. If, for example, the required tolerance on a dimension is $\pm 0.02\text{ mm}$, then the measuring machine uncertainty should be no more than one-fifth (ideally one-tenth) of that, i.e. $4\mu\text{m}$. This means that with a general-purpose CMM, when the measured length exceeds $14.8''$ (375mm), machine uncertainty exceeds one-fifth of the dimension tolerance in this case. In contrast, as shown in the figure on the right, with the CRYSTA-Apex S the measurement uncertainty remains within one-fifth of the dimension tolerance up to $30.2''$ (766mm). The higher accuracy specification of the CRYSTA-Apex S therefore gives it more than double the effective measuring range in terms of accuracy-guarantee capability in this case. **ISO 10360-2:2009*



Temperature compensation system

The CRYSTA-Apex S comes equipped with a temperature compensation system that guarantees the accuracy of measurement under temperature conditions of 60.8 to $78.8\text{ }^\circ\text{F}$ (16 to $26\text{ }^\circ\text{C}$). This system, based on permanently installed temperature sensors on each scale working together with sensors placed on the workpiece, monitors scale and workpiece temperatures and, monitors the temperature and, before outputting the measurement result to the controller, corrects it to the value that would be measured at $68\text{ }^\circ\text{F}$ ($20\text{ }^\circ\text{C}$), taking into account the workpiece material expansion coefficient as well as the CMM's characteristics. The combined scale/workpiece temperature compensation scheme used on the CRYSTA-Apex S gives markedly superior results compared to systems that only compensate for scale temperature.



500 Series



CRYSTA-Apex S 544

700 Series



CRYSTA-Apex S 776

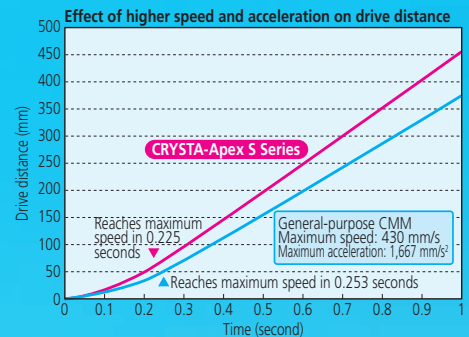
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YSTA-Apex S Series

High-speed, high-acceleration drive

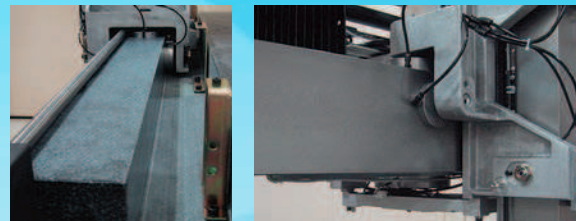
The CRYSTA-Apex S Series offers a maximum drive speed of 519mm/s (20.4"/s) and a maximum acceleration of 2,309mm/s² (7.57"/s²) [500/700/900 Series], resulting in an increase of almost 100 mm in drive distance in one second, when compared with general-purpose CNC coordinate measuring machines (with a maximum speed of 430mm/s (16.9"/s) and a maximum acceleration of 1,667mm/s² (5.46"/s²)).

Furthermore, with a maximum measuring speed (i.e., the speed with which the stylus traces over the workpiece) of 8mm/s (0.31"/s), the CRYSTA-Apex S produces measurements much more quickly than ordinary CMMs (with a maximum measuring speed of 5mm/s (0.19"/s)). Combining high speed and high acceleration, the CRYSTA-Apex S dramatically reduces measuring time, with the difference between the CRYSTA-Apex S and ordinary CMMs only increasing as the number of measuring points increases, resulting in a significant reduction in measuring cost.



Designed for high rigidity

As is the case with Mitutoyo's conventional CMMs, various structures are employed in the CRYSTA-Apex S in order to give the body higher rigidity. The Y-axis guide rail, which is attached to one side of the granite surface plate, shows very little deterioration with use, and thus promises to maintain high accuracy for a long time. The air bearings located on the bottom face, in addition to those at the front, rear, and upper surfaces of the slider unit of the X-axis, minimize vibration even during high-speed, high-acceleration movement, thus ensuring stable linear motion.



Integrated Y-Axis in Granite Table

900 Series



CRYSTA-Apex S 9106

1200 Series



CRYSTA-Apex S 122010

NOTE: PC system & workstation provided are not as shown

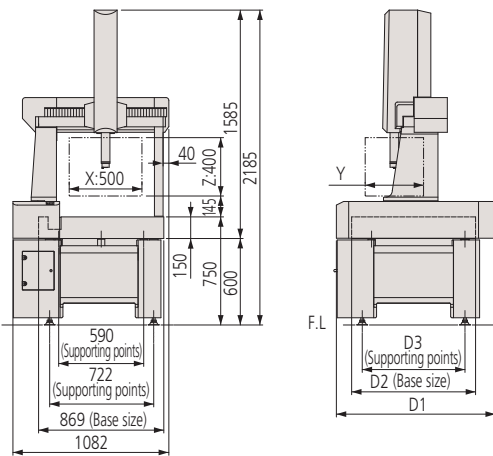
CRYSTA-Apex S 500 Series



NOTE: PC system & workstation provided are not as shown

Note: This machine incorporates a main unit Startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.

CRYSTA-Apex S 500 Series Dimensions unit: inch (mm)



Model No.		CRYSTA-Apex S 544	CRYSTA-Apex S 574
Measuring range	X axis	19.68" (500mm)	
	Y axis	15.74" (400mm)	27.55" (700mm)
	Z axis	15.75" (400mm)	
Resolution	0.00004" (0.0001mm)		
Guide method	Air bearings on each axis		
Drive speed	8-300mm/s (CNC mode), max. speed: 519mm/s 0 - 80mm/s (J/S Mode: High Speed) 0 - 3mm/s (J/S Mode: Low Speed) 0.05mm/s (J/S Mode: Fine Speed)		
Max. measuring speed	8mm/s		
Max. drive acceleration	Each axis: 1,333 mm/s ² , max. combined acceleration: 2,309 mm/s ²		
Workpiece	Maximum height	21.45" (545mm)	
	Maximum mass	396.8lb (180kg)	
Mass (including the control device and installation platform)		1,135lbs. (515kg)	1,377lbs. (625kg)
	Pressure	58 PSI (0.4MPa)	
Air supply	Consumption	1.76CFM (50L/min) under normal conditions	
	Air source	3.53CFM (100L/min)	

CRYSTA-Apex S 500 Series Accuracy unit: μm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009	Maximum permissible probing error (P _{FTH,MPE}) ISO 10360-5:2010
SP25M (Stylus: ø4 X 50mm)	1.7+3 L/1000 (temperature environment 1) 1.7+4 L/1000 (temperature environment 2)	1.7
TP200 (Stylus: ø4 X 10mm)	1.9+3 L/1000 (temperature environment 1) 1.9+4 L/1000 (temperature environment 2)	1.9
TP20 (Stylus: ø4 X 10mm)	2.2+3 L/1000 (temperature environment 1) 2.2+4 L/1000 (temperature environment 2)	2.2

* L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

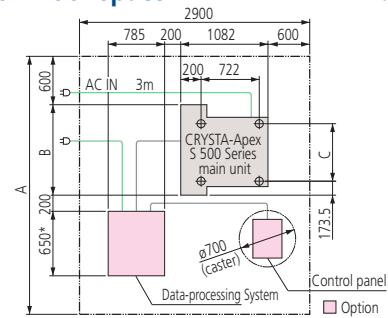
CRYSTA-Apex S 500 Series Accuracy ISO 10360-4 unit: μm

Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 X 50 mm)	2.3μm (50s)

CRYSTA-Apex S 500 Series Installation Temperature

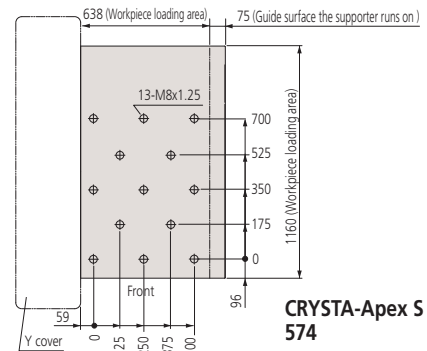
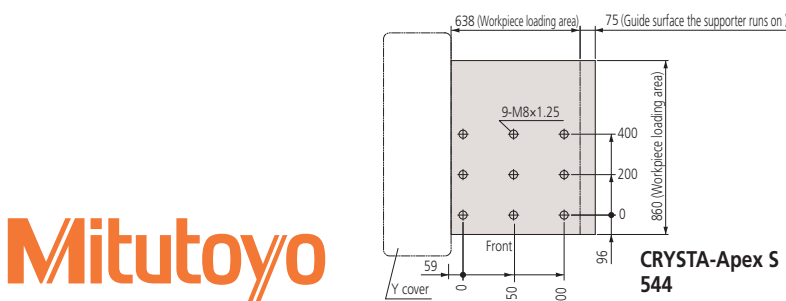
		Temperature environment 1	Temperature environment 1
Limits within which accuracy is guaranteed	Temperature Range	20±2 °C (64.4-71.6 °F)	16 - 26 °C (60.8-78.8 °F)
	Rate of change	1 °C per hour or less 2 °C in 24 hours or less	1 °C per hour or less 5 °C in 24 hours or less
	Gradient	1 °C or less per meter	1 °C or less per meter

Installation floor space unit: inch (mm)



Model No.	A	B	C	D1	D2	D3	Y
CRYSTA-Apex S544	126" (3200)	44.2" (1122)	28.1" (713)	44.2" (1122)	33.9" (860)	28.1" (713)	16.1" (405)
CRYSTA-Apex S574	138" (3500)	57.5" (1458)	39.9" (1013)	57.5" (1458)	45.7" (1160)	39.9" (1013)	27.8" (705)

Measuring table (Tapped insert) Dimensions (unit: mm)



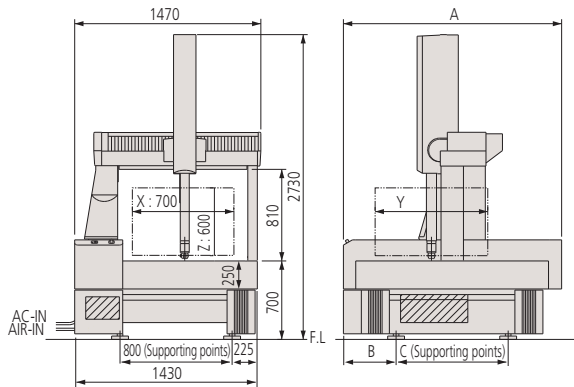
CRYSTA-Apex S 700 Series



NOTE: PC system & workstation provided are not as shown

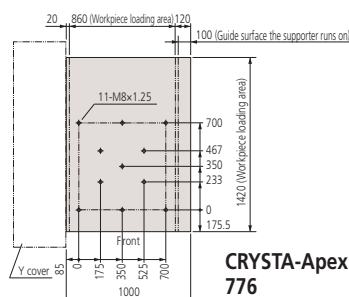
Note: This machine incorporates a main unit Startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.

CRYSTA-Apex S 700 Series Dimensions unit: inch (mm)

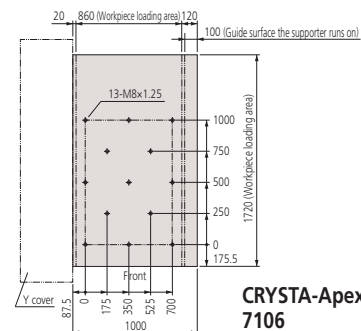


Model No.	A	B	C	Y
CRYSTA-Apex S776	65" (1650)	16.5" (420)	32" (800)	27.8" (705)
CRYSTA-Apex S7106	76.8" (1950)	18.5" (470)	39.4" (1000)	39.6" (1005)

Measuring table (Tapped insert) Dimensions (unit: mm)



CRYSTA-Apex S
776



CRYSTA-Apex S
7106

Model No.		CRYSTA-Apex S 776	CRYSTA-Apex S 7106
Measuring range	X axis	27.6" (700mm)	
	Y axis	27.55" (700mm)	39.36" (1000mm)
	Z axis	23.62" (600mm)	
Resolution	0.00004" (0.0001mm)		
Guide method	Air bearings on each axis		
Drive speed	8-300mm/s (CNC mode), max. speed: 519 mm/s 0 - 80mm/s (J/S Mode: High Speed) 0 - 3mm/s (J/S Mode: Low Speed) 0.05mm/s (J/S Mode: Fine Speed)		
Max. measuring speed	8 mm/s		
Max. drive acceleration	Each axis: 1,333 mm/s ² , max. combined acceleration: 2,309 mm/s ²		
Workpiece	Maximum height	31.49" (800mm)	
	Maximum mass	1,763lbs. (800kg)	2,204lbs. (1000kg)
Mass (including the control device and installation platform)	3,692lbs. (1675kg)		4,301lbs. (1951kg)
Air supply	Pressure	58 PSI (0.4MPa)	
	Consumption	1.76CFM (50L/min) under normal conditions	
	Air source	3.53CFM (100L/min)	

CRYSTA-Apex S 700 Series Accuracy ISO 10360-2 unit: μm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009	Maximum permissible probing error P _{FTU,MPE} ISO 10360-5:2010
SP25M (Stylus: ø4 X 50mm)	1.7+3 L/1000 (temperature environment 1) 1.7+4 L/1000 (temperature environment 2)	1.7
TP200 (Stylus: ø4 X 10mm)	1.9+3 L/1000 (temperature environment 1) 1.9+4 L/1000 (temperature environment 2)	1.9
TP20 (Stylus: ø4 X 10mm)	2.2+3 L/1000 (temperature environment 1) 2.2+4 L/1000 (temperature environment 2)	2.2

* L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

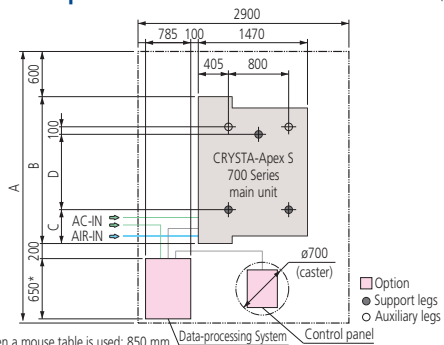
CRYSTA-Apex S 700 Series Accuracy ISO 10360-4 unit: μm

Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 X 50 mm)	2.3μm (50s)

CRYSTA-Apex S 700 Series Installation Temperature

Limits within which accuracy is guaranteed	Temperature environment 1	
	Temperature Range	20±2 °C (64.4-71.6 °F) 16 - 26 °C (60.8-78.8 °F)
	Rate of change	1 °C per hour or less 1 °C per hour or less 2 °C in 24 hours or less 5 °C in 24 hours or less
	Gradient	1 °C or less per meter 1 °C or less per meter

Installation floor space unit: inch (mm)



Model No.	A	B	C	D
CRYSTA-Apex S776	130" (3300)	65" (1650)	16.5" (420)	32" (800)
CRYSTA-Apex S7106	142" (3600)	76.8" (1950)	18.5" (470)	39.4" (1000)

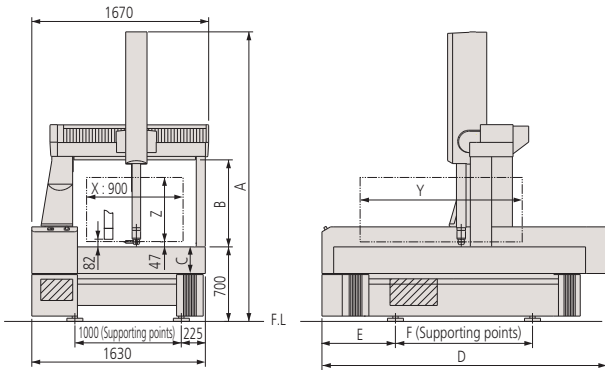
CRYSTA-Apex S 900 Series



NOTE: PC system & workstation provided are not as shown

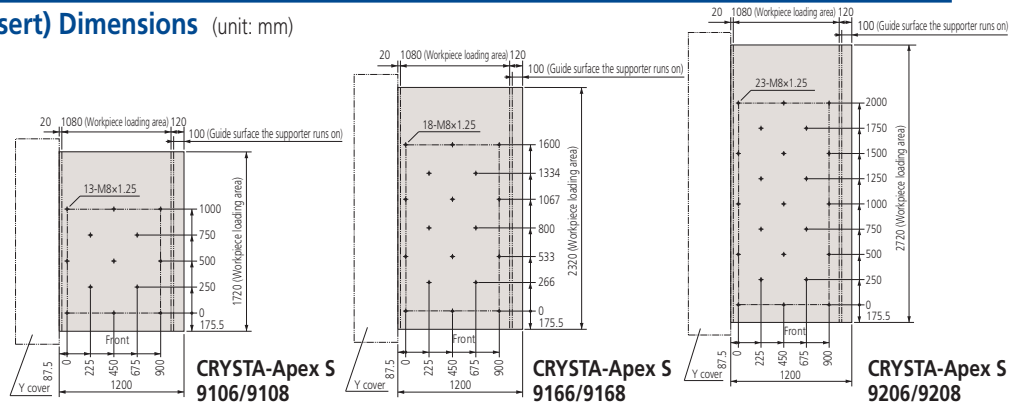
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CRYSTA-Apex S 900 Series Dimensions unit: inch (mm)



Model No.	A	B	C	D	E	F	Y	Z
CRYSTA-Apex S9106			10" (250)	76.8" (1950)	18.5" (470)	39.4" (1000)	39.6" (1005)	23.8" (605)
CRYSTA-Apex S9166	107.5" (2730)	32" (800)	10" (250)	106" (2690)	27.6" (700)	52" (1320)	63.2" (1605)	
CRYSTA-Apex S9206			11.8" (300)	121.7" (3090)	32" (800)	59.1" (1500)	79" (2005)	
CRYSTA-Apex S9108			10" (250)	76.8" (1950)	18.5" (470)	39.4" (1000)	39.6" (1005)	32.1" (805)
CRYSTA-Apex S9168	123.3" (3130)	39.4" (1000)	10" (250)	106" (2690)	27.6" (700)	52" (1320)	63.2" (1605)	
CRYSTA-Apex S9208			11.8" (300)	121.7" (3090)	32" (800)	59.1" (1500)	79" (2005)	

Measuring table (Tapped insert) Dimensions unit: mm



Model No.		CRYSTA-Apex S 9106 / [9108]	CRYSTA-Apex S 9166 / [9168]	CRYSTA-Apex S 9206 / [9208]
Measuring range	X axis	35.43" (900mm)		
	Y axis	39.36" (1000mm)	62.99" (1600mm)	78.3" (2000mm)
	Z axis	23.62" (600mm) / [31.49" (800mm)]		
Resolution	0.000004" (0.0001mm)			
Guide method	Air bearings on each axis			
Drive speed	8 - 300mm/s (CNC mode), max. speed: 519mm/s 0 - 80mm/s (J/S Mode: High Speed) 0 - 3mm/s (J/S Mode: Low Speed) 0.05mm/s (J/S Mode: Fine Speed)			
Max. measuring speed	8mm/s (3mm/s for Type Z800)			
Max. drive acceleration	0.23G / [0.17G] (3D)			
Workpiece	Maximum height	31.49" (800mm) / [39.36" (1000mm)]		
	Maximum mass	2,645lbs. (1200kg)	3,306lbs. (1500kg)	3,968lbs. (1800kg)
Mass (including the control device and installation platform)		4,919lbs. (2231kg) [4,985lbs. (2261kg)]	6,322lbs. (2868kg) [6,389lbs. (2898kg)]	8,625lbs. (3912kg) [8,691lbs. (3942kg)]
	Pressure	58 PSI (0.4MPa)		
Air supply	Consumption	2.11CFM (60L/min) under normal conditions		
	Air source	3.53CFM (100L/min)		

CRYSTA-Apex S 900 Series Accuracy ISO 10360-2 unit: μm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009	Maximum permissible probing error (P _{FTU,MPE}) ISO 10360-5:2010
SP25M (Stylus: ø4 X 50mm)	1.7+3 L/1000 (temperature environment 1) 1.7+4 L/1000 (temperature environment 2)	1.7
TP200 (Stylus: ø4 X 10mm)	1.9+3 L/1000 (temperature environment 1) 1.9+4 L/1000 (temperature environment 2)	1.9
TP20 (Stylus: ø4 X 10mm)	2.2+3 L/1000 (temperature environment 1) 2.2+4 L/1000 (temperature environment 2)	2.2

* L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

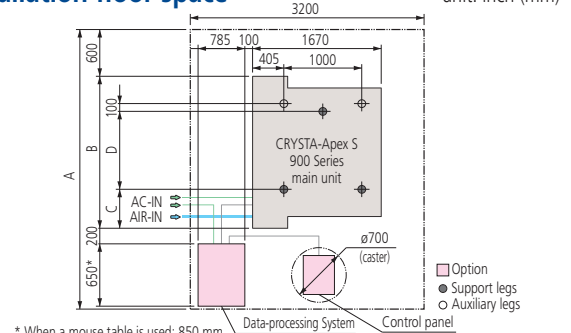
CRYSTA-Apex S 900 Series Accuracy ISO 10360-4 unit: μm

Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 X 50 mm)	2.3μm (50s)

CRYSTA-Apex S 900 Series Installation Temperature

	Temperature environment 1	Temperature environment 1
Limits within which accuracy is guaranteed	Temperature Range: 20±2 °C (64.4-71.6 °F)	16 - 26 °C (60.8-78.8 °F)
	Rate of change: 1 °C per hour or less 2 °C in 24 hours or less	1 °C per hour or less 5 °C in 24 hours or less
	Gradient: 1 °C or less per meter	1 °C or less per meter

Installation floor space unit: inch (mm)



* When a mouse table is used: 850 mm
When a 2-monitor dedicated rack is used: 1,000 mm

Model No.	A	B	C	D
CRYSTA-Apex S9106/9108	142" (3600)	76.8" (1950)	18.5" (470)	39.4" (1000)
CRYSTA-Apex S9166/9168	169" (4300)	106" (2690)	27.6" (700)	52" (1320)
CRYSTA-Apex S9206/9208	185" (4700)	121.7" (3090)	32" (800)	59.1" (1500)

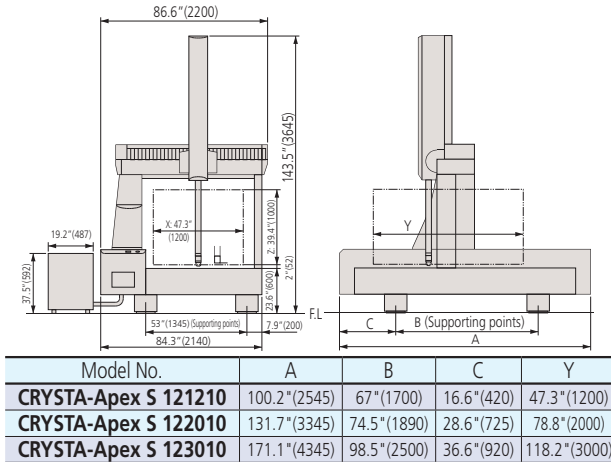
CRYSTA-Apex S 1200 Series



NOTE: PC system & workstation provided are not as shown

Note: This machine incorporates a main unit Startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.

CRYSTA-Apex S 1200 Series Dimensions unit: inch (mm)



Model No.		CRYSTA-Apex S 121210	CRYSTA-Apex S 122010	CRYSTA-Apex S 123010
Measuring range	X axis	47.24" (1200mm)		
	Y axis	47.24" (1200mm)	78.73" (2000mm)	118.10" (3000mm)
	Z axis	39.36" (1000mm)		
Resolution	0.0001mm (0.1µm)			
Guide method	Air bearings on each axis			
Drive speed	8 - 400 mm/s (CNC mode), max. speed: 693 mm/s 0 - 80 mm/s (J/S Mode: High Speed) 0 - 3 mm/s (J/S Mode: Low Speed) 0.05 mm/s (J/S Mode: Fine Speed)			
Max. measuring speed	5mm/s			
Max. drive acceleration	Each axis: 1,000 mm/s ² , max. combined acceleration 1,732 mm/s ²			
Workpiece	Maximum height	47.24" (1200mm)		
	Maximum mass	4,409lbs. (2000kg)	5,511lbs. (2500kg)	6,613lbs. (3000kg)
Mass (including the control device and installation platform)		8,928lbs. (4050kg)	13,558lbs. (6150kg)	20,084lbs. (9110kg)
Air supply	Pressure	58 PSI (0.4MPa)		
	Consumption	100 L/min under normal conditions (air source: 150 L/min)		
	Air source	5.29CFM (150L/min)		

CRYSTA-Apex S 1200 Series Accuracy ISO 10360-2 unit: µm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009	Maximum permissible probing error (P _{FTU,MPE}) ISO 10360-5:2010
SP25M (Stylus: ø4 X 50mm)	2.3+3L/1000 (temperature environment 1) 2.3+4L/1000 (temperature environment 2)	2.0
TP200 (Stylus: ø4 X 10mm)	2.5+3L/1000 (temperature environment 1) 2.5+4L/1000 (temperature environment 2)	2.2
TP20 (Stylus: ø4 X 10mm)	2.8+3L/1000 (temperature environment 1) 2.8+4L/1000 (temperature environment 2)	2.6

* L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

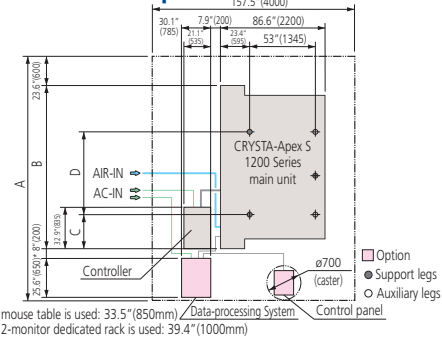
CRYSTA-Apex S 1200 Series Accuracy ISO 10360-4 unit: µm

Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 X 50 mm)	2.8µm (50s)

CRYSTA-Apex S 1200 Series Installation Temperature

		Temperature environment 1	Temperature environment 1
Limits within which accuracy is guaranteed	Temperature Range	20±2 °C	16 - 26 °C
	Rate of change	1 °C per hour or less 2 °C in 24 hours or less	1 °C per hour or less 5 °C in 24 hours or less
	Gradient	1 °C or less per meter	1 °C or less per meter

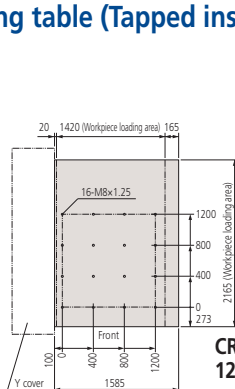
Installation floor space



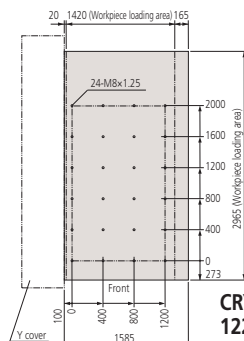
* When a mouse table is used: 33.5" (850mm)
When a 2-monitor dedicated rack is used: 39.4" (1000mm)

Model No.	A	B	C	D
CRYSTA-Apex S 121210	163.2" (4145)	100.2" (2545)	16.6" (420)	67" (1700)
CRYSTA-Apex S 122010	194.7" (4945)	131.7" (3345)	28.6" (725)	74.5" (1890)
CRYSTA-Apex S 123010	234.1" (5945)	171.1" (4345)	36.3" (920)	98.5" (2500)

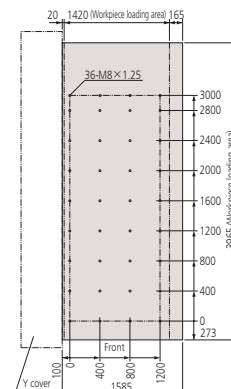
Measuring table (Tapped insert) Dimensions (unit: mm)



CRYSTA-Apex S 121210



CRYSTA-Apex S 122010

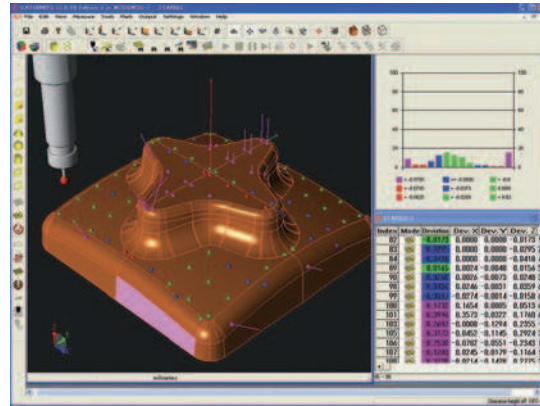


CRYSTA-Apex S 123010

Group of options that enable various kinds of measurements



Mitutoyo



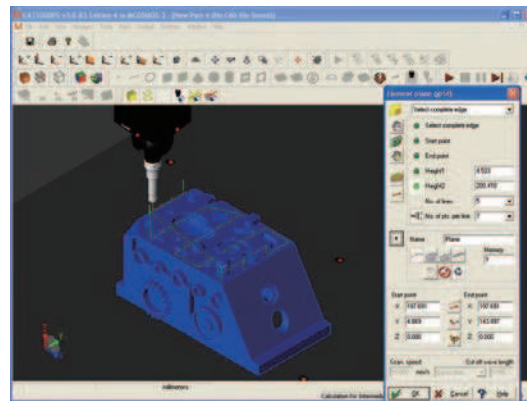
CAT1000S (freeform surface evaluation program)

Checks and compares the workpiece with the CAD data containing freeform surfaces and directly outputs the results in the form of CAD data in various formats. Software to directly convert from/to various types of CAD data is available as an option.



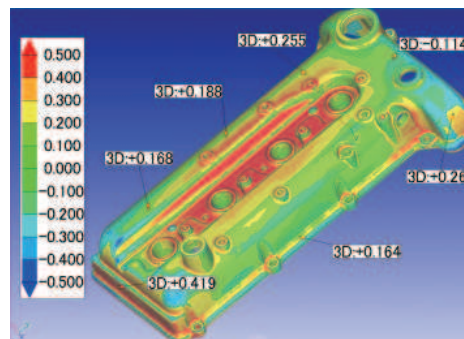
CAT1000P (off-line teaching program)

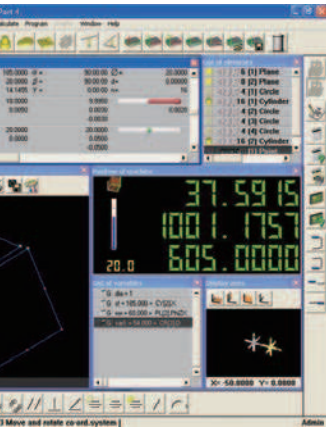
This module enables the user to use CAD data and on-screen simulation to create parts programs for making automated measurements (off-line teaching). This module allows the user to begin creating a parts program as soon as the design data has been finalized, shortening the entire process.



MSURF (non-contact laser measurement and evaluation program)

MSURF-S is used for obtaining measured point cloud data with the SurfaceMeasure (non-contact laser probe), while MSURF-I is used for comparing this data with the master model data, and for making dimensional measurements. Furthermore, MSURF-G for offline teaching allows the user to create a measurement macro even without the actual workpiece, improving the measuring machine's uptime.





GEOPAK (high-functionality general-purpose measurement program)

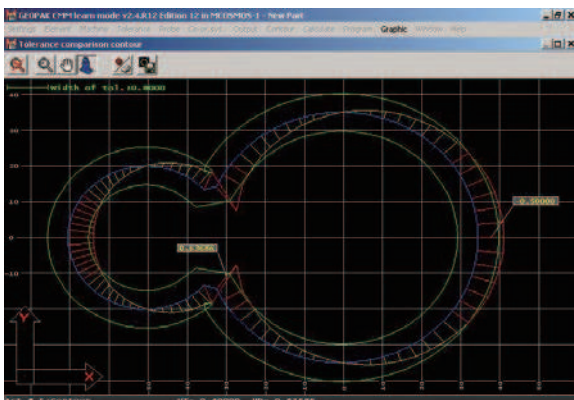
This module is the heart of the MCOSMOS software system and is used to measure and analyze geometric elements. All the functions are provided by icons or pull-down menus, so even novices can promptly select desired functions. Its main features include easier viewing of measuring procedures and results such as realtime graphic display of measurement results and a function for direct call-up of elements from results graphics.



SurfaceMeasure606

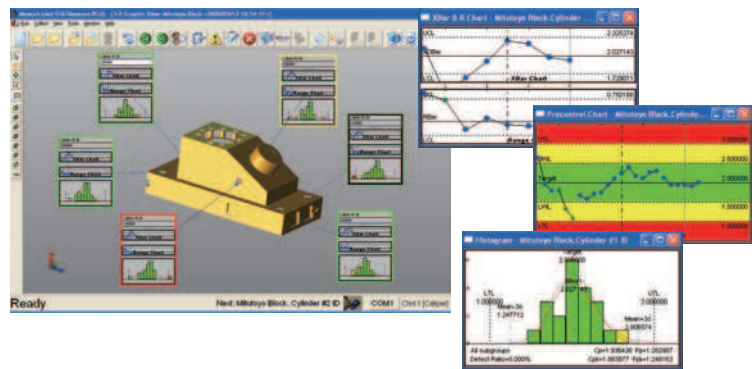
SurfaceMeasure606 (non-contact laser probe)

Lightweight, high-performance, non-contact probe developed for CNC coordinate measuring machines. Powder spray-less measurement has been achieved through automatic setting of appropriate laser intensity and camera sensitivity according to environment or material, providing a simpler and more comfortable laser scanning environment.



SCANPAK (contour measurement program)

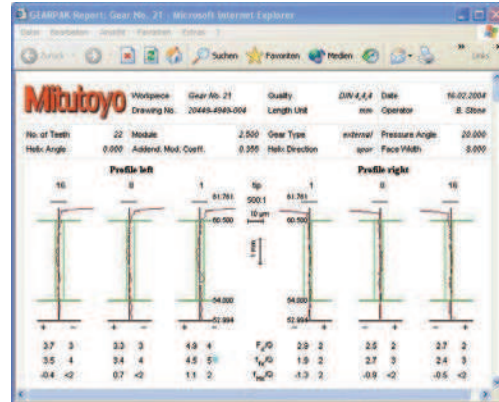
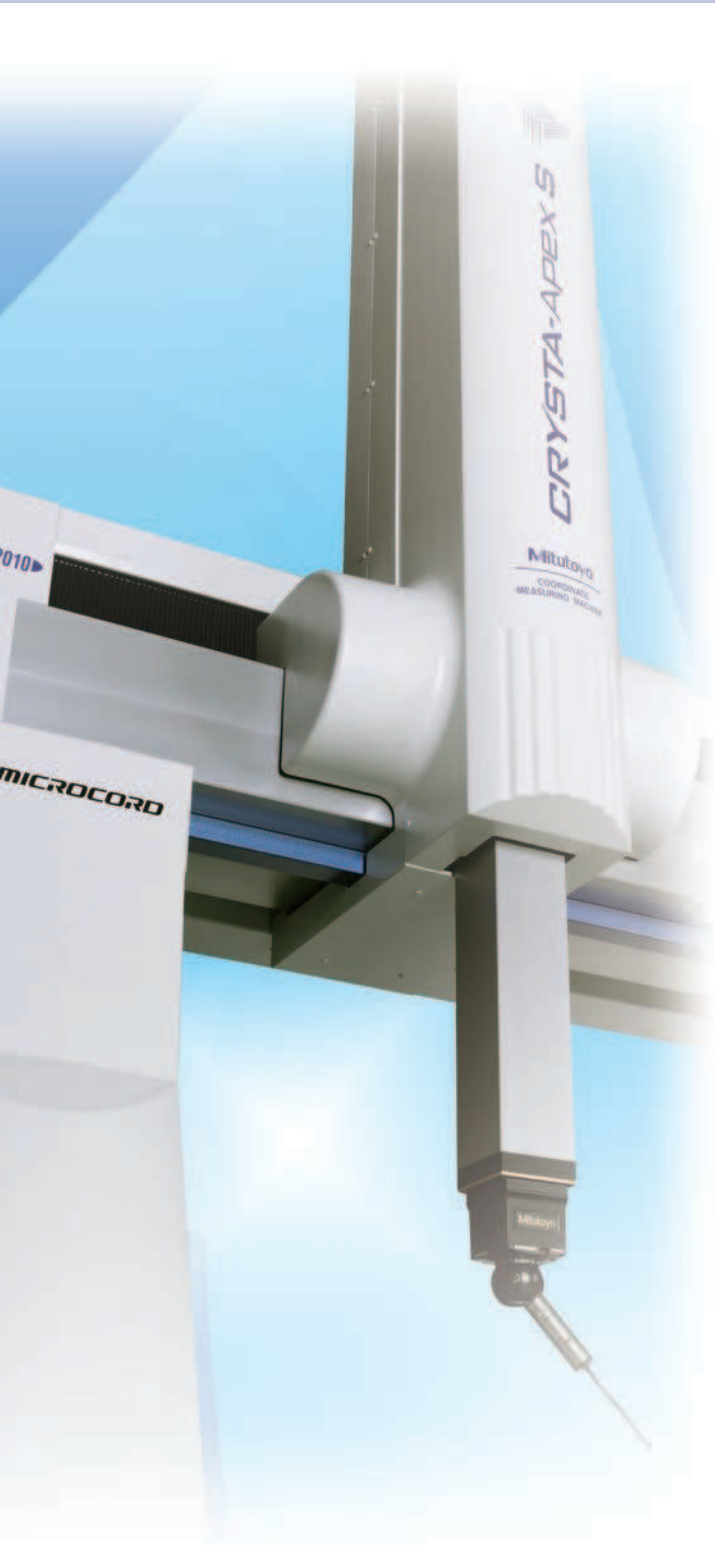
Software for scanning and evaluating workpiece contours (2D). Evaluates contour tolerance between measurement data and design data, and performs various types of element and inter-element calculations based on a desired range of measurement data specified by the user.



MeasurLink STATMeasure Plus (statistical-processing and process-controlling program)

Performs various types of statistical computations using measurement results. In addition, by displaying a control diagram on a real-time basis, this program allows defects that may occur in the future (e.g., wearing or damaging of cutting tools) to be discovered early on. This program can also be linked to a higher-level network environment to build a central control system.

Group of options that enable various kinds of measurements



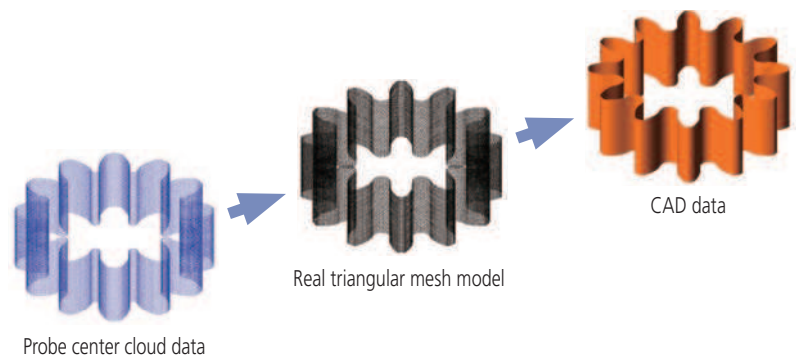
GEARPAK (gear evaluation program)

For evaluating the most types of involute gears.



UMAP-CMM

This head makes it possible to use an ultra-small diameter stylus (0.1- or 0.3-mm diameter). It can be installed on PH10MQ to measure the shape and dimensions of microfabricated products from multiple directions.

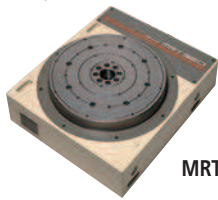


This program generates free-form surface models from multi-sectional contour data.

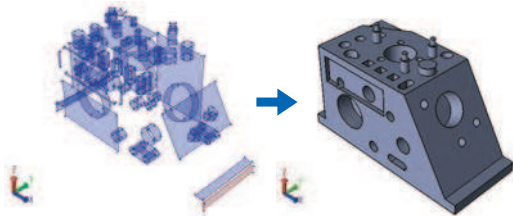


MPP-310Q (scanning probe)

Probe that collects coordinate values (point cloud data) at high accuracy by moving at speeds of up to 120 mm/s while in contact with the workpiece. Because MPP-310Q can also be used with the rotary table (MRT320) for synchronous scanning, it is effective for measuring gears, blades, ball screws, cylindrical cams, etc.

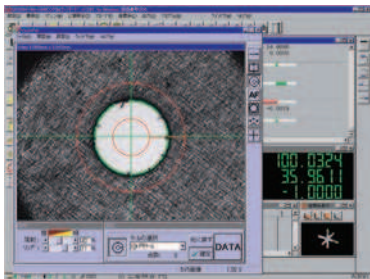


MRT320



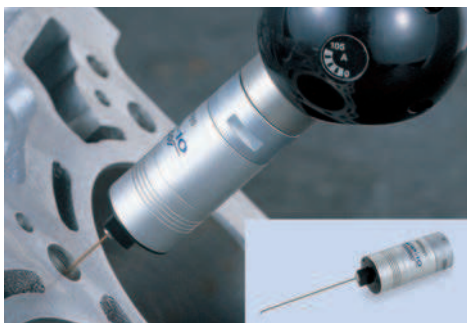
Solid Model Developer

This program generates CAD data from data measured using MCOSMOS.



VISIONPAK (vision measurement program)

This program controls QVP and performs various computational analyses on captured images.



MPP-10 (probe for effective screw depth measurement)

The probe that made it possible for a coordinate measuring machine to measure effective screw depth for the first time in the world. The introduction of the auto probe changing system allows normal dimensional measurements as well as effective screw depth measurements to be made automatically.



SP25M (compact high-accuracy scanning probe)

This is a compact, high-accuracy, multi-function scanning probe with a 25-mm outside diameter that makes scanning measurements, high-accuracy point measurements, and centripetal point measurements (optional function). The SP25M is used with the PH10MQ/10M auto probe head to provide a high degree of measurement freedom.



QVP (vision probe)

This probe automatically detects edges from image data of the workpiece magnified by a CCD camera. It is extremely useful for measuring microfabricated products that cannot be measured using a contact-type probe and soft objects that cannot be subjected to any measurement force. The QVP can also be used for measuring height based on autofocusing.



- Coordinate Measuring Machines
- Vision Measuring Systems
- Form Measurement
- Optical Measuring
- Sensor Systems
- Test Equipment and Seismometers
- Digital Scale and DRO Systems
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